

## NATURAL RESOURCES CONSERVATION SERVICE

### CONSERVATION PRACTICE STANDARD

#### Grassed Waterway

(Acre)

Code 412

#### DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.

#### PURPOSES

To convey runoff from terraces, diversions, or other water concentrations without causing erosion or ponding and to improve water quality.

#### CONDITIONS WHERE PRACTICE APPLIES

All sites where added capacity, vegetative protection, or both are required to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices. This practice is not applicable where its construction would destroy important woody wildlife cover and the present watercourse is not seriously eroding and is capable of handling the concentrated runoff. Such situations are usually recognizable by a meandering condition, steep side slopes that are stabilized by woody plants or herbaceous vegetation, and the watercourse is without rapidly advancing overfalls.

#### CRITERIA

Capacity. The minimum capacity shall be that required to confine the peak runoff expected from a storm of 10-year frequency, 24-hour

duration obtained by using the procedure in Chapter 2, Engineering Field Manual, except that when the waterway slope is less than 1 percent out of bank flow for the 10-year frequency runoff may be permitted if such flow will not cause erosion. The minimum capacity in such cases shall be that required to carry within the channel the runoff as determined by using the "B" drainage curve.

Velocity. Design velocities shall not exceed those obtained by using the procedures and recommendations in Chapter 7, Engineering Field Manual. The design velocity for stability shall be based on "D" retardance and the capacity shall be based on "C" retardance. Design velocities shall not exceed 5 feet per second.

Width. The bottom width of trapezoidal waterways shall not exceed 70 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

Side Slopes. Side slopes shall not be steeper than 2:1. Where farm equipment must cross the waterway during farming operations side slopes shall not be steeper than 6:1. A flatter slope may be recommended to accommodate the land user's equipment. Waterways may be constructed either parabolic or trapezoidal in cross-section.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at or below the design water surface elevation in the terrace,

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diversion, or other tributary channel at their junction when both are flowing at design depth.

**Drainage.** Subsurface Drains (606), Underground Outlets (620), stone center waterways or other suitable measures shall be provided for in the design of sites having prolonged flow, a high seasonal water table, or seepage problems. Water-tolerant vegetation such as Reed Canarygrass may be an alternative on some wet sites if siltation is not a problem. Subsurface drains should be offset from the center line at least one-fourth the top width of the waterway and be at least one foot below the grade of the waterway. The subsurface drains should not be offset too far that it is not effective in providing adequate drainage to the waterway. In all cases, the drain must have at least two feet of cover. Subsurface drains must be installed on both sides of the waterway if high water table or other site conditions create seepage into the channel from both sides.

**Outlet.** All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earth ditch, a grade stabilization structure, or other suitable outlet.

**Establishment of Vegetation.** Grassed waterways will be vegetated according to practice standard Critical Area Planting (342).

## CONSIDERATIONS

Special attention shall be given to maintaining and improving visual resources and habitat for wildlife where applicable. All grassed waterways shall be planned as part of a resource management system. The soil loss from the watershed draining into the waterway must be evaluated when the sedimentation from upland erosion on land not controlled by the landowner/user will impair the proper functioning of the waterway. The waterway should not be constructed until structural measures, or appropriate land use and/or management changes, have been made to reduce the erosion to an acceptable level.

The effects on water quantity and quality shall be considered. Since this practice is installed in areas of concentrated flow, the effect on the

quantity of ground and surface water is minor. However, there may be a slight reduction in the peak discharge from the watershed. This practice will reduce the erosion in a concentrated flow area, such as in a gully or ephemeral gullies. This results in the reduction of sediment and substances delivered to the receiving waters. Vegetation may act as a filter in removing some of the sediment delivered to the waterway, although this is not the primary function of the grass. Any chemicals applied to the waterway in the course of treatment of adjacent cropland may move directly into the surface waters in the case where there is a runoff even shortly after spraying.

The most critical time in successfully installing grassed waterways is when vegetation is being established. Special protection such as mulch anchoring, erosion control blankets, or other diversion methods are warranted at this critical period. Supplemental irrigation may also be warranted. The vegetation should be well established, where possible, before large flows are permitted in the channel. The landowner/user will be advised if wetlands will be affected and that USDA/NRCS wetland policy will apply. All work planned shall be in compliance with General Manual Title 450-GM, Part 405, Subpart A, Compliance with Federal, State, and Local Laws and Regulations.

## PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

**General.** Construction operations shall be carried out in such a manner and sequence that erosion and air and water pollution will be minimized and held within acceptable limits. Construction methods that enhance wildlife will be used where practical. Trees, stumps, and brush removed from the construction area may be piled for wildlife habitat when approved by the landowner/user.

The completed job shall present a professional appearance and shall conform to the line, grades and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used.

Site Preparation. All trees, stumps, brush and similar materials are to be removed from the construction area and disposed of in a manner consistent with environmental concerns and proper functioning of the waterway.

Excavation. To the extent needed, all suitable materials removed from the specified excavation shall be used in construction of the earth fill areas of the waterway. All surplus or unsuitable material shall be disposed of in a manner that will not interfere with flow into the waterway. If possible, no spoil shall be deposited adjacent to the waterway unless such spoil and the adjacent area have a positive grade toward the waterway or inlets.

Fill Placement. The material placed in the fill areas of the waterway shall be free of sod, roots, frozen soil, stones over 3 inches in diameter and other objectionable material.

The distribution and gradation of materials shall be such that there will be no lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material. The work area shall be kept free of standing water when fill is being placed.

The placing and spreading of the fill shall be started at the lowest point of the foundation and the fill shall be brought up in approximately horizontal layers not to exceed 9 inches in thickness. Each layer will be compacted by complete coverage with the hauling and spreading equipment.

Moisture Control. The minimum moisture content of the fill material and foundation shall be such that when kneaded in the hand the fill material will form a ball, which does not readily separate. The maximum moisture content is when conditions are too wet for efficient use of the hauling and compaction equipment.

Construction Tolerances. The following are guidelines for waterway construction:

#### Trapezoidal waterway

	Grade <2%	Grade >2%
Depth at Centerline	Grade to 0.2' below	Grade +10% of Grade
Depth at Toe	Grade to 0.2' above	
Bottom Width	10% wider not to exceed 2'	

#### Parabolic Waterway

	Grade <2%	Grade >2%
Depth at Centerline	Grade to 0.2' below	Grade +10% of Grade
Top Width	10% wider not to exceed 5'	

There will be no reverse grades. Trapezoidal waterways will be constructed so low flows remain in the center and the side slopes are nominally to grade with no unsightly humps or hollows.

Topsoiling. Where establishment of vegetation is a problem on exposed subsoil (all subsoils except loam, silt loam and sandy loam) topsoil shall be stockpiled and re-spread where necessary to provide a seedbed. Areas to be topsoiled will be over excavated to allow for topsoiling to planned grade. Where subsoil is exposed, topsoil will be placed in the waterway in accordance with the following:

-A minimum of four inches of topsoil ("A" horizon) will be placed where six or more inches of friable soil material with good moisture holding properties (more than 0.15 inches per inch) lies below the surface of the cut area.

-A minimum of eight inches of topsoil ("A" horizon) will be placed where less than six inches of friable soil material with good moisture holding properties (more than 0.15 inches per inch) lies below the surface of the cut area.

-Topsoil will be placed in final shaping operations. If needed, the underlying soil will be

chiseled or scarified to permit proper bonding to topsoil.

**Finish and Cleanup.** The waterway and designated spoil areas will be finished in a relatively smooth condition ready for seeding. All rocks 3" in diameter or larger and roots shall be removed from the waterway and spoil area surfaces.

**Vegetative Establishment.** Whenever possible, excess water shall be directed away from the waterway until vegetation is established. Any protective works shall be removed and the disturbed areas seeded to permanent grass after the vegetation in the waterway is established.

If needed, apply lime to raise the pH to the level desired for species of vegetation being seeded.

Fertilize according to soil tests or at a minimum rate of 500 lbs. of 12-12-12 fertilizer, or its equivalent, per acre as soon as the waterway has been constructed within the seeding periods. Application of 150 lbs. per acre of ammonium nitrate 6 to 8 weeks after seeding on soils low in organic matter and fertility on high velocity waterways with large drainage areas will greatly improve vegetation establishment.

Work the fertilizer and lime into the soil to a depth of 2 to 3 inches with a harrow or disk. Prepare a firm seedbed with a cultipacker or cultipacker type seeder.

Seed one of the following grass mixtures during the preferred seeding periods of March 1 to May 10 or August 10 to September 30.

Species	Minimum of PLS
(1) Tall Fescue	35#/acre
(2)*Tall Fescue	25#/acre (shaded sites)
Creeping red fescue	10#/acre
(3)*Reed canary grass	18#/acre
(4) Kentucky bluegrass	40#/acre (urban areas)
(5) Smooth brome grass	35#/acre

PLS – pure live seed

\*Adapted to poorly drained soils.

1/4#/acre of Ladino clover may be added to all but (4) of the above seed mixtures.

When construction is completed between May 11 and August 9, a temporary cover crop should be established using one of the following:

Species	Minimum Rates
(1) Wheat	150#/acre
(2) Rye	150#/acre
(3) Spring oats	100#/acre
(4) Annual rye grass	20#/acre
(5) Corn	150 to 300#/acre

After August 10, the temporary cover should be removed or incorporated, fertilizer applied, seedbed prepared and permanent seeding done in normal manner.

Make seedings across the waterway to avoid rows running up and down hill. Operating a cultipacker seeder in an S curve or weaving pattern is an acceptable procedure for seeding.

On critical sites, mulch with 1-1/2 to 2 tons straw per acre. Anchor the mulch with an asphalt spray, netting or a mulch anchoring tool, in accordance with practice standard (484)

**Mulching.** In areas of sharp breaks in channel grade or where excessive velocities would cause channel scour, paper netting, jute netting, rock lining, erosion control blankets or sod should be used.

## OPERATION AND MAINTENANCE

A maintenance program shall be established by the landowner/user to maintain capacity and vegetative cover. Items to cover are:

1. Do not graze waterway during establishment and when soil conditions are wet.
2. Protect waterway from damage by farm equipment and vehicles. Do not use waterway as a roadway and practice care when crossing to prevent tillage marks or wheel tracks.
3. Maintain constructed width by lifting or disengaging tillage equipment properly, and avoid farming operations along waterways, which would hinder water entry.

4. Do not spray with herbicides and do not cross waterways during spray operations unless the equipment is completely shut off.
5. Fertilize waterways according to soil tests (not to exceed 500 lbs./acre of 12-12-12) the first spring or fall after seeding and thereafter as necessary to maintain a vigorous stand of grass. Caution should be used in fertilization to maintain water quality.
6. Mow waterways regularly to maintain a healthy, vigorous sod. Time the first mowing after ground nesting birds have hatched (about August 1). Remove excess top growth. Do not burn or overgraze.
7. Repair all broken subsurface drain lines adjacent to or in the waterway.
8. Re-establish vegetative cover immediately where scour erosion has removed established seeding.
9. Maintain effective erosion control of the contributing watershed to prevent siltation and the resulting loss of capacity.